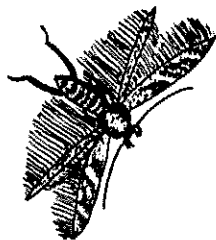
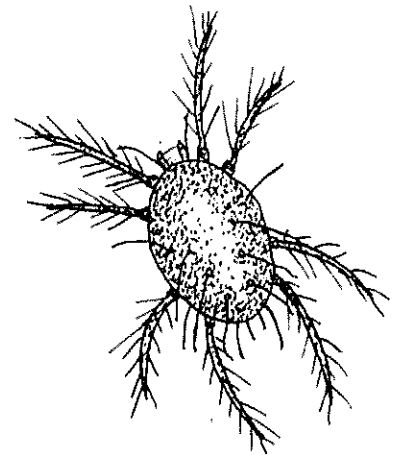
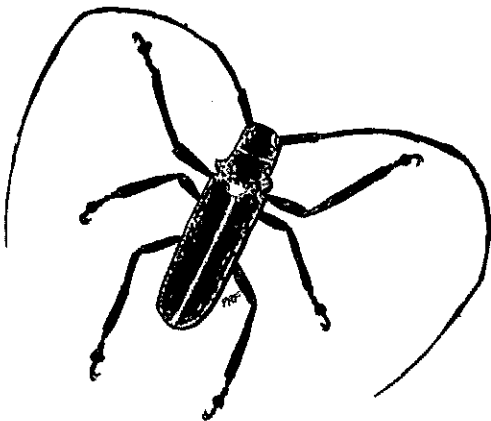




MICHIGAN FOREST PEST DETECTION PROGRAM

REPORT FOR 1959



COMPILED BY:

FORESTRY DIVISION, MICHIGAN DEPARTMENT OF CONSERVATION

COOPERATORS:

STATE DEPARTMENT OF AGRICULTURE, U. S. FOREST SERVICE,
MICHIGAN STATE UNIVERSITY, UNIVERSITY OF MICHIGAN,
PRIVATE FOREST INDUSTRY

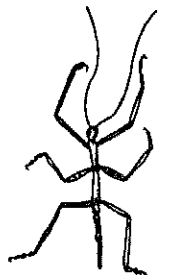


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INTRODUCTION

The Michigan Forest Pest Detection Program functions through the cooperation of many individuals, public agencies and private companies. Greatly increased interest in the problems of forest insects and diseases in the past few years, coupled with a reasonable and coordinated approach, have kept the program moving forward on an even keel to a point where it is making an increasingly valuable contribution to the welfare of the forests of the state.

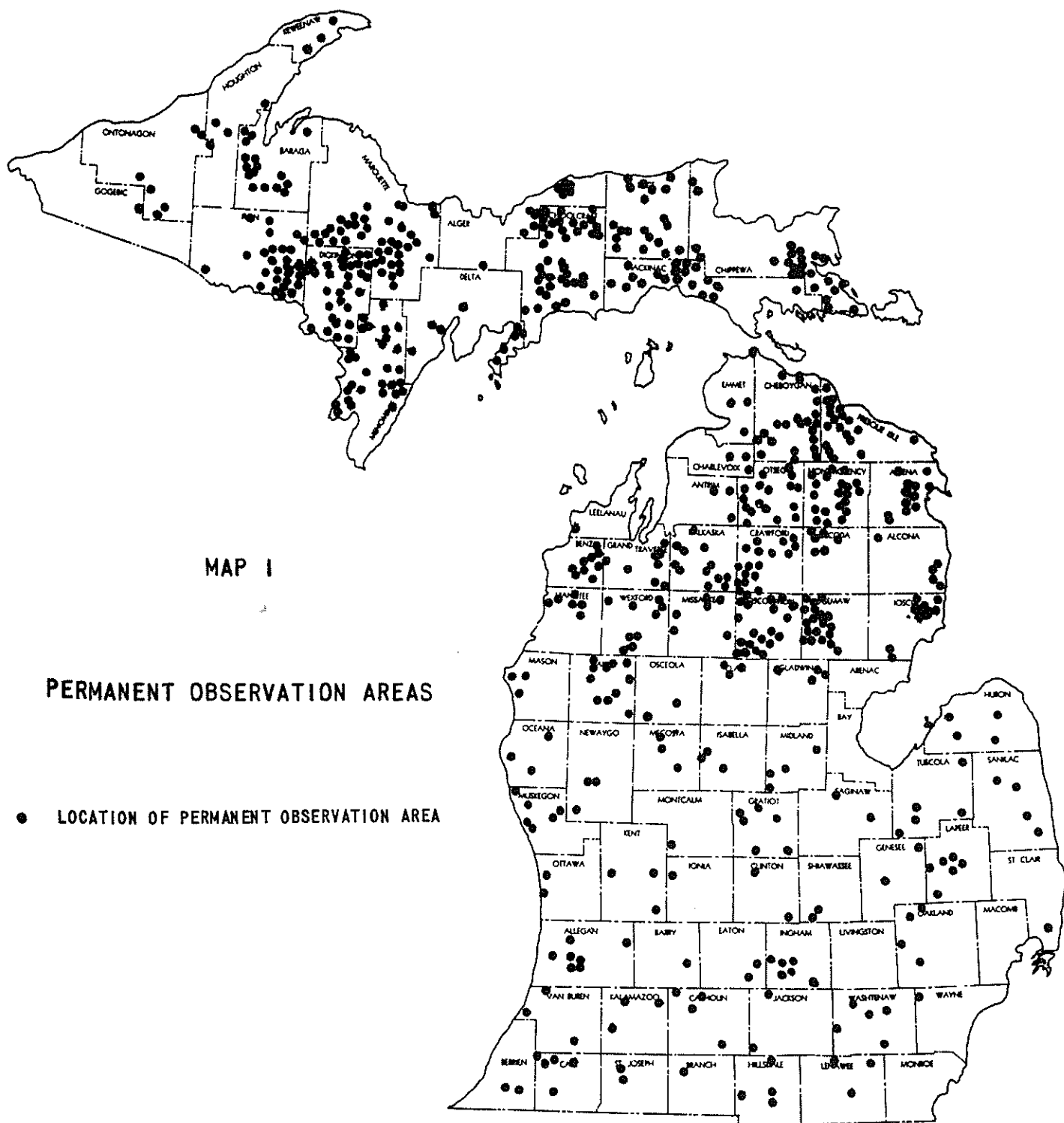
Cooperation with neighboring states in regional activities is an important part of the program. The Ninth Annual Lakes States Forest Insect Survey Conference was held in Ann Arbor, Michigan, in February, with representatives of federal, state and private agencies participating. The major problem confronting this group is the standardization and coordination of survey techniques and activities in Minnesota, Wisconsin and Michigan. To this end, standardized survey techniques have been approved for the spruce budworm, larch sawfly, forest tent caterpillar, Saratoga spittlebug, jack pine budworm, pine tortoise scale, red-headed pine sawfly, white pine weevil, and balsam gall midge.

On December 15 the annual meeting of the Michigan Forest Pest Detection Program Committee was held in Lansing to review the work carried on during the year by the various agencies concerned with surveys, control and research; to discuss the annual report; and to make plans for 1960. Those in attendance were:

- U. M. Martilla, U.S.F.S., National Forests
- J. K. Kroeber, U.S.F.S., Regional Office
- W. E. Miller, U.S.F.S., Experiment Station
- L. E. Nelson, U.S.F.S., Blister Rust Control
- T. D. Stevens, Forestry Department, M.S.U.
- L. E. Bell, Forestry Department, M.S.U.
- J. W. Butcher, Entomology Department, M.S.U.
- S. A. Graham, School of Natural Resources, U. of M.
- J. B. Cody, Private Industry
- W. S. Cath, Michigan Department of Agriculture
- W. J. Young, Michigan Department of Agriculture
- A. F. Monroe, Soil Conservation Service
- G. S. McIntire, Michigan Department of Conservation
- J. W. Leonard, Michigan Department of Conservation
- N. F. Smith, Michigan Department of Conservation
- R. E. Pfeifer, Michigan Department of Conservation
- P. R. Flink, Michigan Department of Conservation

Information on the pest conditions on federal lands was obtained in part from the Lake States Forest Experiment Station report on "The More Important Forest Insects in the Lake States in 1959," and the U. S. Forest Service report, "Annual Regional Report on Forest Insects and Disease Conditions - Region 9."

* * *



ORGANIZATION OF PROGRAM

Increasing awareness and concern about losses caused by insects and diseases to the forests of Michigan led to the beginning of a forest pest detection program in 1950. The program was outlined and organized by the Conservation Department with the cooperation of the U. S. Bureau of Entomology and Plant Quarantine (now the Division of Forest Insect Research, U. S. Forest Service), the U. S. Forest Service; the School of Natural Resources, University of Michigan; the Departments of Entomology, and Botany and Plant Pathology, and Forestry Extension Service, Michigan State University; the Division of Plant Industry, State Department of Agriculture.

The program involves more than the mere detection of forest pest outbreaks, its objectives being: (1) to detect the presence of forest insects and diseases, and to apprehend outbreaks by systematically and annually collecting records of occurrence and damage; (2) to facilitate and organize direct control in case of emergency; and (3) to provide a basis for protective measures by indirect means.

The detection framework is built principally around the field organization of the Forestry Division of the Conservation Department, which handles state and private lands and the U. S. Forest Service which handles federal lands. The general field plan for insects insofar as the State Forestry Division districts are concerned, calls for the establishment of permanent observation areas scattered throughout each forest district on both state and private lands in timber stands where critical insects exist or are likely to appear. (See Map I.) Observation reports are submitted annually to the Lansing office of the division, indicating the degree of infestation, or the absence, of each of the critical insects on the designated plots. Those critical insects found only in the southern part of the state are not reported on in the northern regions, and vice versa. Thus, each district forester has only six to eight critical insects to observe.

The two educational institutions participate in training programs and act in an advisory capacity on insect and disease identification and control measures, as does also the Division of Forest Insect Research of the U. S. Forest Service.

The State Department of Agriculture, through its Division of Plant Industry, is directly concerned in the program by virtue of its statutory authority to establish quarantines, to enter on private lands for purposes of inspection, and, where necessary, to compel or provide for the control of serious insect pests and contagious plant diseases.

The disease phase of the program does not follow the same routine as applied to insects, since there are relatively few "critical" forest diseases requiring constant surveillance. Individual programs have been developed for the most important diseases with various state and federal agencies cooperating in survey and control work.

* * *

PROGRAM ACTIVITIES

PEST INFORMATION SHEETS

A series of pest information sheets was initiated in 1956 as a function of the Michigan Forest Pest Detection Program in response to requests by plantation owners, tree farmers, foresters and others for uniform and simplified information on the important pests of forest trees. Augmented in the two succeeding years, 20 individual sheets have been prepared. Pests now covered are white pine weevil, European pine sawfly, European pine shoot moth, Saratoga spittlebug, red-headed pine sawfly, eastern spruce gall aphid, larch sawfly, forest tent caterpillar, eastern tent caterpillar, mites or red spiders, anomala beetle, spruce budworm, jack pine budworm, birch skeletonizer, walkingstick, pine spittlebug, pine sawyer beetle, pine needle rust, hardwood defoliators and eastern gall rust.

Basic information and sketches are prepared by Paul R. Flink, Forestry Division entomologist, and all material and recommendations are approved and agreed upon by the agencies cooperating in the Pest Detection Program. The leaflets can be readily changed and reprinted as changes in control recommendations or other information warrant. The leaflets on the European pine shoot moth and white pine weevil were revised during 1958.

The separate sheets have been assembled into a booklet entitled, "Michigan Forest Pests", which has been distributed to cooperators, land owners, teachers and others with a direct interest in forest pest problems.

Leaflets on part or all of the following pests are contemplated during 1960: Pine tortoise scale, Zimmerman pine moth, larch casebearer, woolly aphid, and gall insects.

SPECIAL REPORTS

In addition to the routine requests for insect observation reports, special reports, in the form of general memorandums, were issued throughout the year whenever it was advisable to alert the cooperators to unusual conditions, new insects in their areas, time for control application or other important information.

Suggested news releases were sent to the Department foresters for their use, saving them the time required to write such articles.

TRAINING SESSIONS

Training sessions on the important forest insects were held for the Conservation Department district foresters in conjunction with annual regional meetings of the Forestry Division. Programs on the identification and control of tree pests were presented at three tree growers meetings.

COOPERATIVE REPORTS

The pest detection program provides information for other cooperative reports as follows:

Cooperative Economic Insect Report - Information on insect infestations and seasonal development is sent to Professor Ray Hutson, Department of Entomology, Michigan State University, who forwards it to the Plant Pest Control Division, Agricultural Service, U. S. Department of Agriculture, for inclusion in the Cooperative Economic Insect Report. This report is a weekly resume of important insects in the United States and includes a section on forest insects.

The Forest Insect and Disease Situation in the Lake States - Annually the forest pest situation in the Lake States is summarized by the Lake States Forest Experiment Station from information submitted by the states and also collected by the Station. The forest insect situation in Michigan as reported in the annual report of the Pest Detection Program is forwarded to the Station for inclusion in the Lake States report.

A Status Report of Forest Insect Conditions - The information compiled in the previously mentioned report by the Lake States Forest Experiment Station is included in the Status Report of Forest Insect Conditions covering the United States and published annually by the Division of Forest Insect Research, Forest Service, U. S. Department of Agriculture in Washington, D.C.

* * *

FOREST INDUSTRY COOPERATION

Industry foresters cooperate in the detection program by reporting on observation plots in areas not covered by state and federal foresters and thus help in presenting a better over-all picture of forest insect conditions in the state. In addition, industry foresters are called upon to assist in special surveys of concern to the companies.

The following companies, including five pulp and paper companies, four mining companies, and two power companies are participating in the forest pest detection program:

Abitibi Corporation
American Box Board Company
Calumet and Hecla
Cleveland Cliffs Iron Company
Consolidated Water Power and Paper Company
Consumers Power Company
Copper Range Company
Escanaba Paper Company
Kimberly-Clark of Michigan, Inc.
Oliver Iron Mining Division, U. S. Steel Corp.
Wisconsin-Michigan Power Company

* * *

OBSERVATION REPORTS

A total of 1,929 observation reports was received and analyzed by the Lansing office of the Forestry Division. This number has been approximately the same for the past five years. In addition to the regular observation reports, letters and cards were received with observations on other forest insect conditions.

The total number of permanent observation areas is now 691, approximately the same as in 1959. (See Map I.)

* * *

CRITICAL INSECTS

The list of critical forest insects in Michigan has been changed from time to time to include actively or potentially injurious insects and to remove from the list those which are no longer considered thus.

No additions or deletions were made this year in the critical insect list reported on in 1958. At the December Pest Detection Program Meeting it was decided that in 1960 the anomala beetle will not be reported on in the Upper Peninsula and a special effort will be made to determine the extent and severity of pine root collar weevil infestations throughout the state.

Following are reports of critical insects for 1959.

JACK PINE BUDWORM - Choristoneura pinus Free.

Summary of Reports

	1951	1952	1953	1954	1955	1956	1957	1958	1959
Total.....	135	185	232	280	291	276	267	269	246
Percent Positive...	38	40	32	20	20	29	22	19	14

Breakdown of 1959 Reports

Heavy defoliation (61-100%)..... 0.....(0%)
Medium defoliation (21-60%)..... 1.....(3%)
Light defoliation (1-20%).....34.....(97%)

JACKPINE BUDWORM (Cont'd.)

This year was the second year of greatly reduced jack pine budworm populations throughout most of Michigan. Former hot spots in Lake, Crawford, Montmorency and Luce counties remained quiet. Moderate defoliation of the observation areas was reported in Baraga, Alger and Marquette counties. (See Map II.)

The U. S. Forest Service, on the other hand, reported heavy infestations on parts of the Manistique, Munising and Sault Ste. Marie districts of the Upper Michigan National Forests. Active and proposed timber sales in these areas are expected to reduce the damage sustained to a tolerable level.

Although the budworm may cause heavy defoliation in scattered areas, in general, the populations in 1960 should remain low.

Figure 1.

Jack pine deformed by white pine weevil attack and red-headed pine sawfly defoliation.



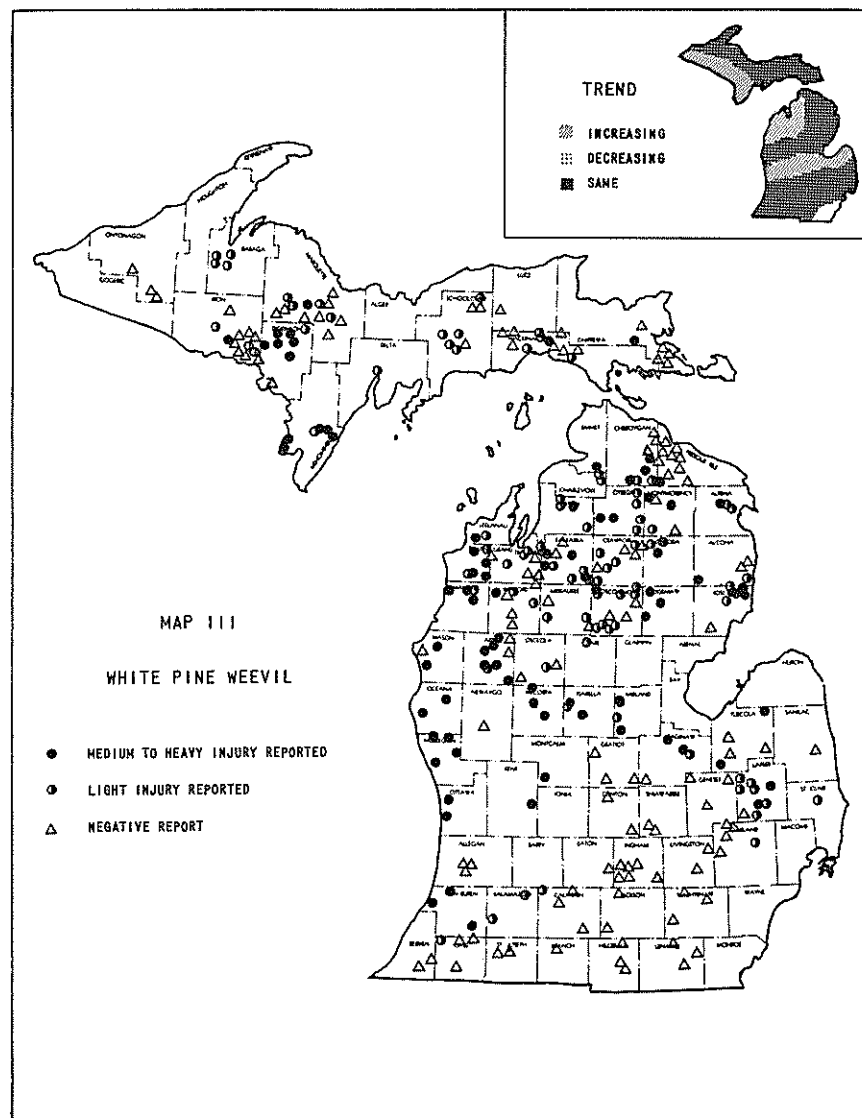
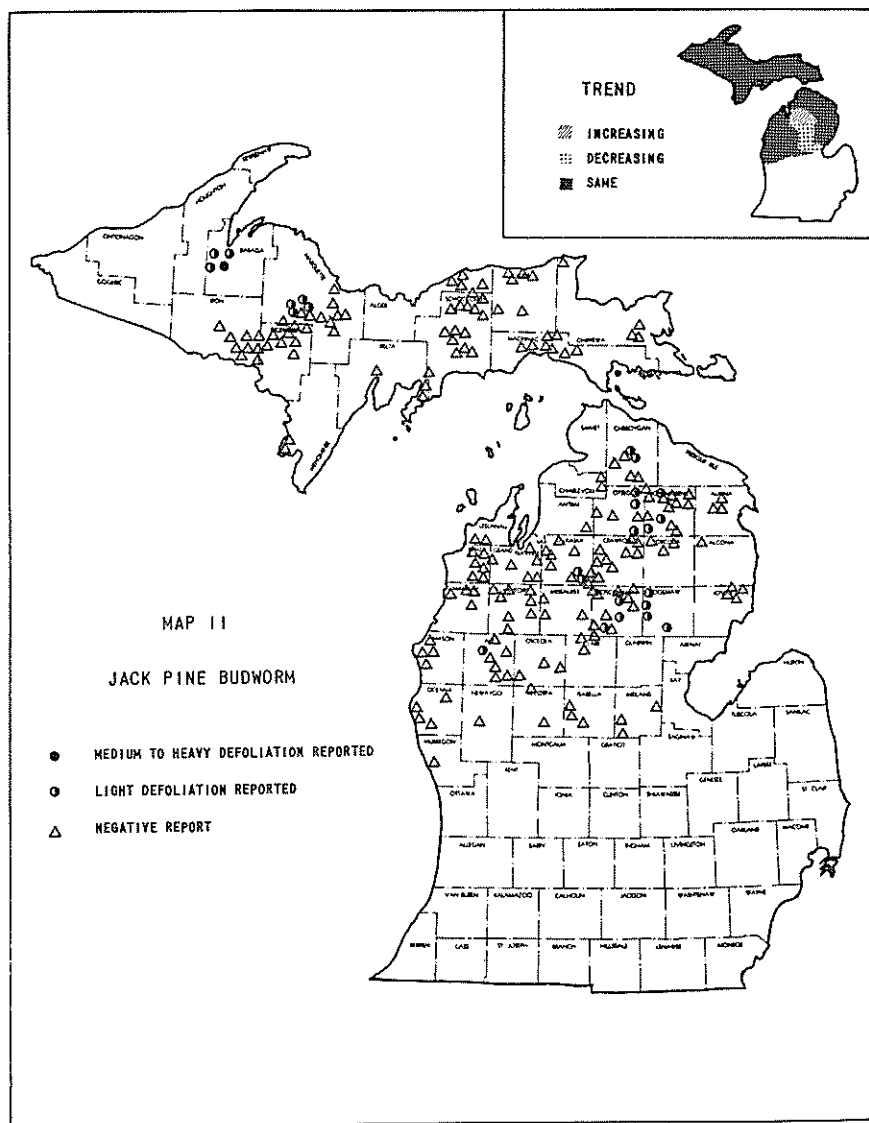
WHITE PINE WEEVIL - *Pissodes strobi* (Peck)

Summary of Reports

	1951	1952	1953	1954	1955	1956	1957	1958	1959
Total.....	39	33	231	278	319	306	317	335	333
Percent Positive...	82	64	65	59	60	53	56	62	58

Breakdown of 1959 Reports

Heavy injury (41-100% of leaders killed).....23.....(12%)
Medium injury (11-40% of leaders killed).....65.....(34%)
Light injury (1-10% of leaders killed).....105.....(54%)



WHITE PINE WEEVIL (Cont'd.)

Infestations of the white pine weevil continue at a high level. Weeviling of over 60% was reported in some of the jack and white pine plantations in Marquette and Chippewa counties in the Upper Peninsula, and Cheboygan, Otsego, Muskegon, Mecosta, Midland, Saginaw and Tuscola counties in the Lower Peninsula. Repeated weeviling has caused severe deformations in stands throughout the state. In addition to the above counties, weeviling of over 40% was reported in Dickinson, Emmet, Presque Isle, Benzie, Manistee, Oceana, Kent and Van Buren counties. (See Map III.) The weevil continues to be absent from the extreme southeastern section of the Lower Peninsula.

The level of infestation is expected to increase slightly in 1960.

Surveys and Control - Surveys were made on about 1,900 acres of state land to determine the amount of weeviling following control operations carried on from 1956 through 1959. During this period hand spraying with DDT and lindane-aroclor solutions, clipping, and a combination of spraying and clipping were used. Listed in decreasing order of effectiveness, the results are: Spraying in April with either a DDT or lindane-aroclor solution followed by clipping in late summer; spraying alone; and clipping alone.

In 1959, 707 acres of jack pine were hand sprayed using inmate labor. Approximately 1.5 man hours were required to spray one acre. Jack pine was sprayed in the following areas:

Au Sable State Forest	Kalkaska County	127 acres
Fife Lake State Forest	Wexford County	279 acres
	Grand Traverse County	88 acres
Houghton Lake State Forest	Missaukee County	213 acres

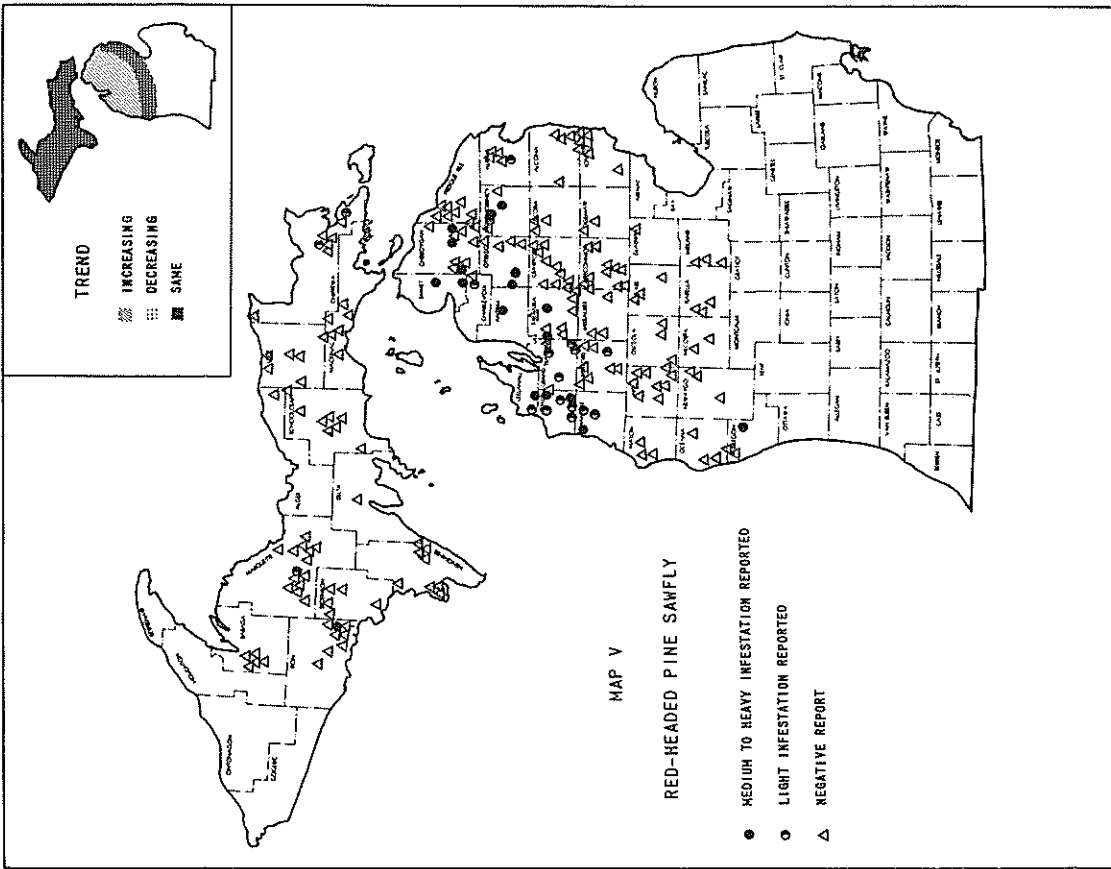
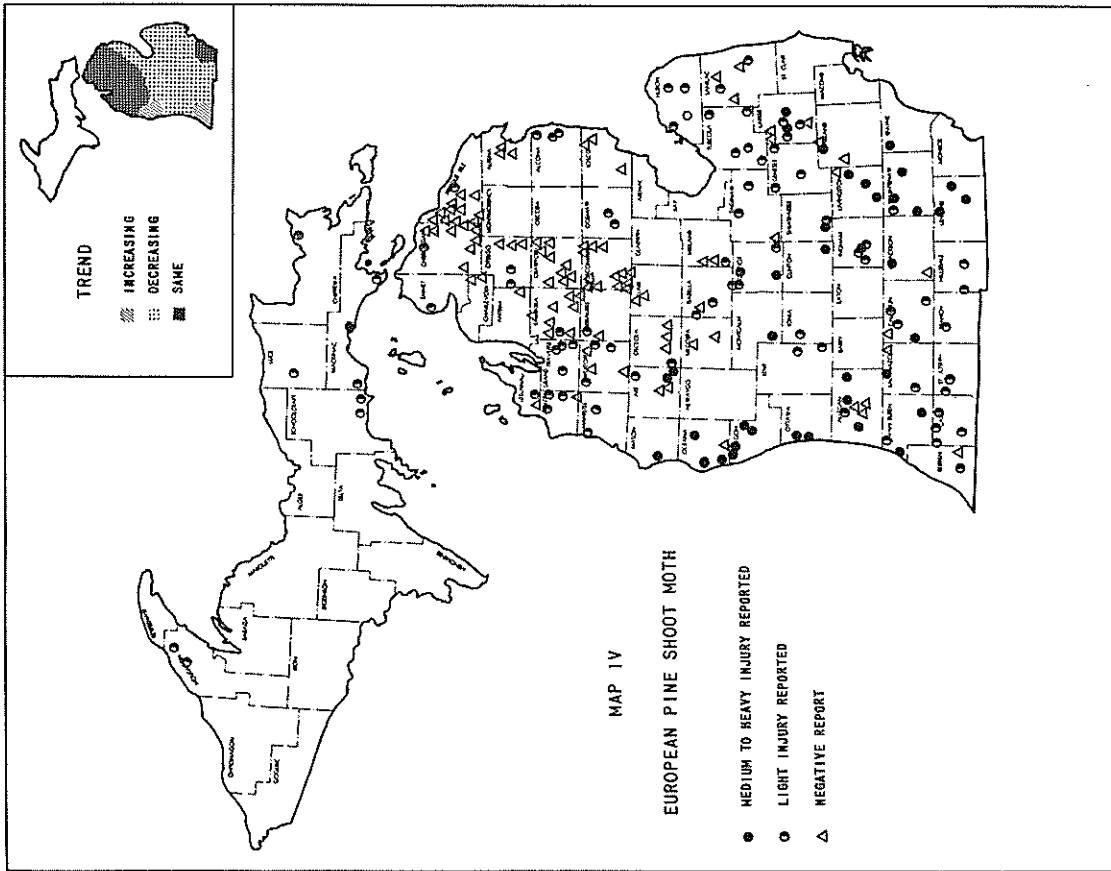
Spraying with DDT and lindane-aroclor in April, 1959, in plantations that had suffered 20 to 40% infestations in 1958, resulted in reductions to less than one per cent weeviling in about 30% of the stands.

The U. S. Forest Service aerielly sprayed 50 acres of jack pine with a lindane and aroclor solution. The results were not satisfactory.

Figure 2.

Inmate labor
spraying jack
pine leaders
to control the
white pine
weevil.





EUROPEAN PINE SHOOT MOTH - *Rhyacionia bouliana* (Schiff.)

Summary of Reports

	1951	1952	1953	1954	1955	1956	1957	1958	1959
Total.....	44	80	119*	203	207	258	242	229	225
Percent Positive...	80	40	47	39	49	42	48	51	52

*Increase due to inclusion of insect on critical list of districts in northern half of Lower Peninsula.

Breakdown of 1959 Reports

**Heavy injury.....32.....(27%)
 **Medium injury.....6.....(5%)
 **Light injury.....80.....(68%)

**Degree of injury = "I" =

$$\frac{\% \text{ of susceptible trees attacked} \times \% \text{ of tips infested}}{100}$$

Heavy if "I" is greater than 20
 Medium if "I" is between 10 and 20
 Light if "I" is less than 10

A general decline in European pine shoot moth damage was noted for the second year over most of its range in Michigan. This is presumably due to larval mortality occurring during the severe winter of 1958-59. Red pine in many areas showed recovery from shoot moth damage. Plantations considered practically worthless now show promise of developing into merchantable trees.

No new areas of infestation were found. It is present in most of the counties in the Lower Peninsula and in Chippewa, Mackinac, Schoolcraft, Luce, and Houghton counties in the Upper Peninsula. (See Map IV.)

The shoot moth will continue as a serious pest of red and Scotch pines, particularly on the poorer sites where the trees are slower growing and take longer to recover from the damage and grow past the most susceptible size.

Control - A DDT spray program to eliminate the shoot moth in the Conservation Department nurseries was effective with the exception of a few beds in one nursery. The 693,000 2-2 red pine in those beds were fumigated with methyl bromide before they left the nursery to prevent the possibility of shipping out live shoot moth larvae.

Plans to spray 1,000 acres in 1959 on the National Forests in western lower Michigan were cancelled due to high mortality of the overwintering larvae.

RED-HEADED PINE SAWFLY - *Neodiprion lecontei* (Fitch)

Summary of Reports

	1951	1952	1953	1954	1955	1956	1957	1958	1959
Total.....	133	173	231	230	260	255	239	249	233
Percent Positive...	18	7	8	8	5	5	16	14	18

Breakdown of 1959 Reports

Heavy defoliation (11-100% susceptible trees attacked)....5....(12%)
Medium defoliation (2-10% susceptible trees attacked).....14....(32%)
Light defoliation (0-1% susceptible trees attacked).....24....(56%)

A continued high level of red-headed pine sawfly populations was present in 1959 through most of the northern Lower Peninsula, particularly in the north-western section. Mortality of jack and red pine occurred, and in many areas control measures were necessary to prevent large numbers of trees being killed.

Moderate to heavy infestations were reported in Iron County in the Upper Peninsula and in Emmet, Cheboygan, Montmorency, Otsego, Antrim, Leelanau, Benzie, Grand Traverse, Kalkaska and Manistee counties in the Lower Peninsula. Additional areas of serious infestations are known to be present in Presque Isle, Wexford and Missaukee counties. (See Map V.)

The red-headed pine sawfly has been a cyclic insect in the past, having peaks of abundance in Michigan about once a decade. It is expected that the sawfly population will remain high in the northern Lower Peninsula, and a control program of at least the same magnitude as in 1959 will have to be carried out in 1960.

Figure 3.

Opening in jack
pine plantation
due to tree mor-
tality following
red-headed pine
sawfly defoli-
ation.



RED-HEADED PINE SAWFLY - (Cont'd.)

Surveys and Control - Based on information on sawfly occurrence and abundance gained through the 1958 pest detection program, it was decided to inspect most of the plantations established since 1950 in the northern part of the Lower Peninsula. Over 200 plantations, varying in size from a few acres to 140 acres, were checked for sawfly infestations prior to setting up the 1959 control program. Many of these areas were eliminated from the control project because of the absence of a damaging infestation.

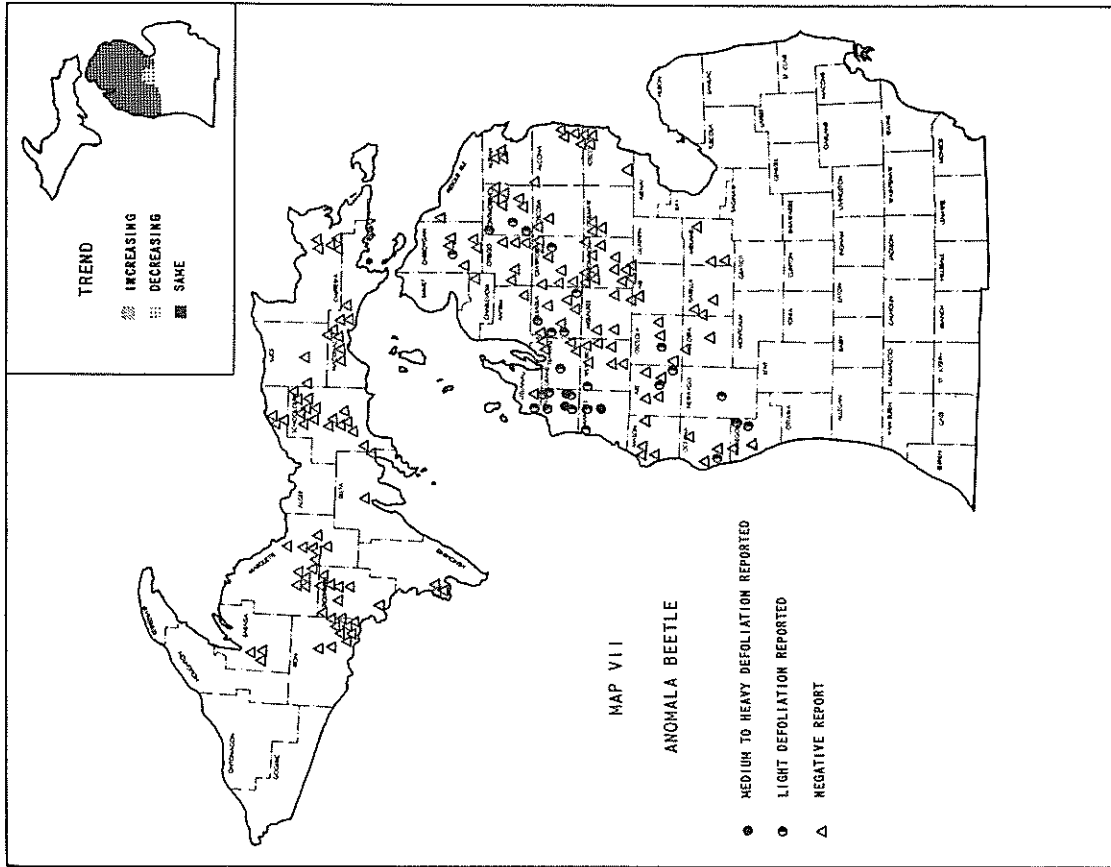
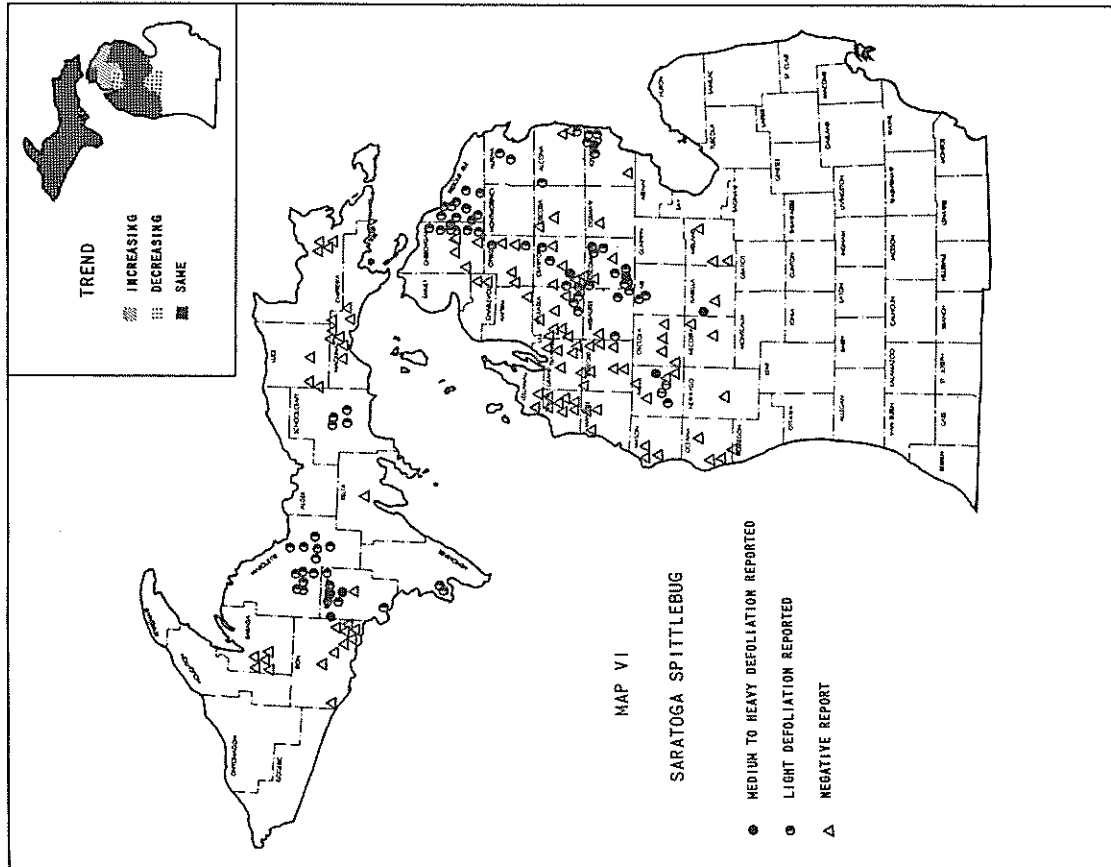
In July, 2,999 acres, of which 2,549 acres were red and jack pine plantations, were aerially sprayed with one pound of DDT in one gallon of oil per acre. The average cost was \$1.44 per acre sprayed, or \$1.69 per acre of actual pine plantation. This cost included the flying services and chemicals.

The following acreages were treated:

Au Sable State Forest	Kalkaska County	706 acres
Black Lake State Forest	Cheboygan County	15 acres
	Presque Isle County	40 acres
Fife Lake State Forest	Benzie County	79 acres
	Grand Traverse County	75 acres
	Manistee County	508 acres
	Wexford County	480 acres
Hardwood State Forest	Emmet County	145 acres
Houghton Lake State Forest	Missaukee County	76 acres
Mackinac State Forest	Mackinac County	57 acres
Pigeon River State Forest	Otsego County	334 acres
Thunder Bay River State Forest	Montmorency County	34 acres
Total		<u>2,549 acres</u>

Control results varied from excellent to poor with satisfactory control on most areas. However, in many places where the pines were planted next to bordering hardwoods, the insecticide did not adequately cover the pine and some sawflies survived. In other places the sawflies were not killed where spray swathes did not completely cover the area or where edges were missed. Some of these areas will probably have to be resprayed in 1960. Where the spray covered all the trees a complete kill was obtained.

The U. S. Forest Service sprayed 47 acres of red pine for sawfly control on the Rapid River District of the Upper Michigan National Forest.



SARATOGA SPITTLEBUG - *Aphrophora saratogensis* (Fitch)

Summary of Reports

	1951	1952	1953	1954	1955	1956	1957	1958	1959
Total.....	17	51	164	211	229	225	214	240	221
Percent Positive...	88	27	34	23	28	27	30	32	42

Breakdown of 1959 Reports.

Heavy injury (61-100%).....0.....(0%)
Medium injury (21-60%).....8.....(8%)
Light injury (1-20%).....86.....(92%)

Widely scattered reports of moderate damage to red and jack pine stands, caused by the Saratoga spittlebug, were received from Dickinson County in the Upper Peninsula and Crawford, Iosco, Roscommon, Isabella and Lake counties in the Lower Peninsula. This damage was due to the increased populations in 1958, and began to show up in the fall of 1958. Generally, throughout the Lower Peninsula, a hot, dry period during the nymphal stage in June, 1959 resulted in a population decline. This population reduction will be reflected in the damage reported in 1960. (See Map VI.)

The spittlebug requires an alternate host, usually sweetfern, in order to complete its life cycle. Therefore, infestations occur only where an abundance of sweetfern is present.

There has been a steady increase in the per cent of positive reports over the past five years indicating a gradual build-up of this insect. The spittlebug will continue to be a problem in pine areas containing sweetfern.

Surveys and Control - During the red-headed pine sawfly survey, the plantations that were being damaged by the Saratoga spittlebug or that were sites of potential build-up, were recorded. Over 200 plantations were checked.

In July, 558 acres were aerially sprayed with one pound of DDT in one gallon of oil per acre. The average cost of the 475 acres of actual pine plantation area was \$1.69 per acre for spraying and materials. Of this area, 238 acres were in Cheboygan County on the Black Lake Forest, and 237 acres were in Roscommon County on the Houghton Lake Forest. Most of this area also had a red-headed pine sawfly infestation that was controlled with the same spray application.

The U. S. Forest Service aerial sprayed 458 acres in Michigan for control of the Saratoga spittlebug. Of this area, 124 acres were on the Rapid River Ranger District and 200 acres on the Manistique Ranger District of the Upper Michigan National Forest, and 134 acres were on the White Cloud Ranger District of the Lower Michigan National Forest.

Figure 4.

Jack pine stand
killed by Sara-
toga spittlebug
infestation.



ANOMALA BEETLE or PINE CHAFER - *Anomala oblivia* Horn

Summary of Reports

	1951	1952	1953	1954	1955	1956	1957	1958	1959
Total.....	119	181	236	278	275	271	269	243	239
Percent Positive...	35	36	32	38	38	37	22	14	14

Breakdown of 1959 Reports

Heavy defoliation (61-100%).....0.....(0%)
 Medium defoliation (21-60%).....3.....(9%)
 Light defoliation (1-20%).....31.....(91%)

Following a period of abundance from 1954 to 1956, anomala beetle populations declined to a low level in 1958 and continued in 1959 at the same low level. Light feeding could be found in plantations in most of the northern Lower Peninsula counties. Moderate defoliation was reported only in Benzie and Manistee counties. (See Map VII.)

This pest is not known to be present in the Upper Peninsula or southern third of the Lower Peninsula.

It is expected that the low population will continue in 1960.

LARCH SAWFLY - *Pristiphora erichsonii* (Htg.)

Summary of Reports

	1951	1952	1953	1954	1955	1956	1957	1958	1959
Total.....	68	113	137	135	145	140	133	131	118
Percent Positive...	0	30*	42	73*	66	81	85	95	97

*The apparent increase is largely due to intensified surveys rather than buildup of insect populations.

Breakdown of 1959 Reports

Heavy defoliation (61-100%).....69.....(60%)
Medium defoliation (21-60%).....28.....(25%)
Light defoliation (1-20%).....17.....(15%)

A spectacular increase in the larch sawfly has taken place in Michigan in the past nine years. Although the sawfly could be found in most larch stands prior to 1951 if a careful search was made, it was not until that year that it became abundant enough to cause noticeable defoliation in a few scattered areas. Since then, the sawflies have become so abundant that almost every larch stand in the northern part of the state is defoliated to some degree.

All reports of the larch sawfly were positive in the Upper Peninsula and in the Lower Peninsula north of Town line 20 North, with the exception of Roscommon, Lake, Newaygo, and Manistee counties where some undefoliated stands were reported.

All stands reported in the Upper Peninsula had at least 20% defoliation, with only two stands in the western two-thirds having less than 60% defoliation. In the Lower Peninsula, the intensity of defoliation was more varied with light, medium and heavy defoliation occurring through much of the northern section. Heavy defoliation was reported in Montmorency, Oscoda, Crawford, Missaukee and Roscommon counties. (See Map VIII.)

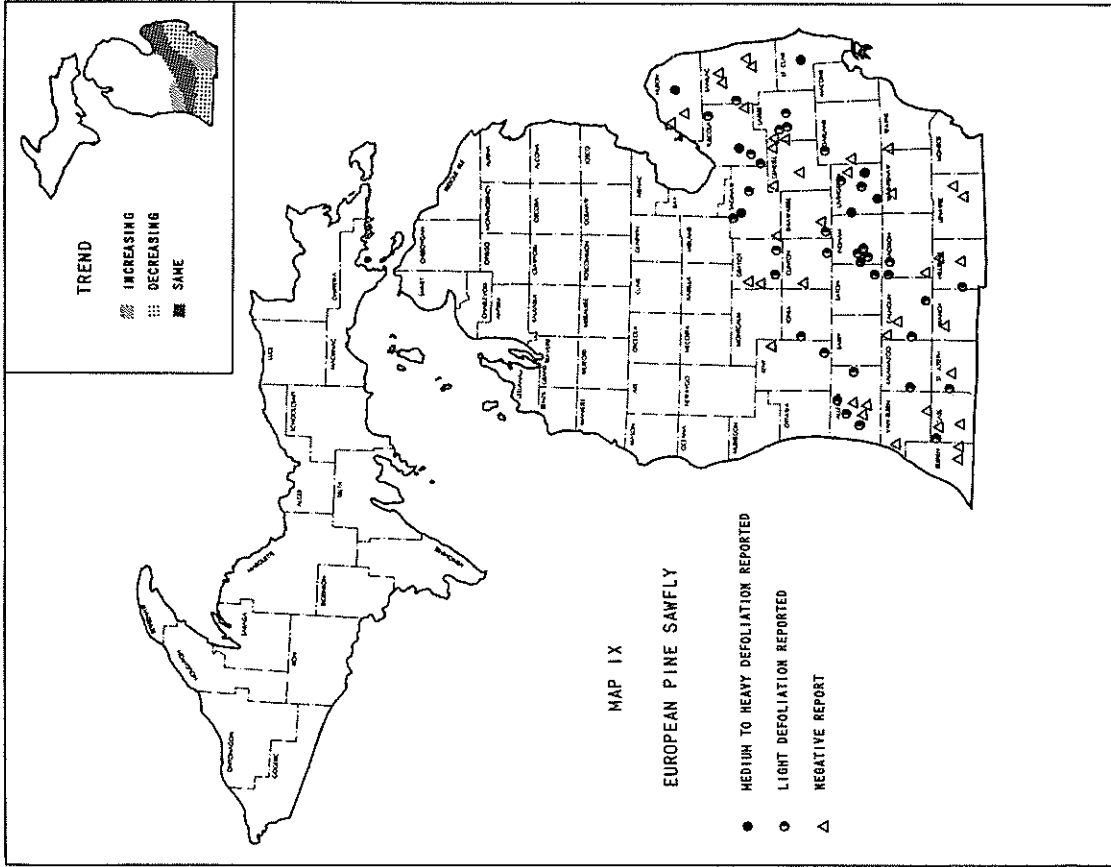
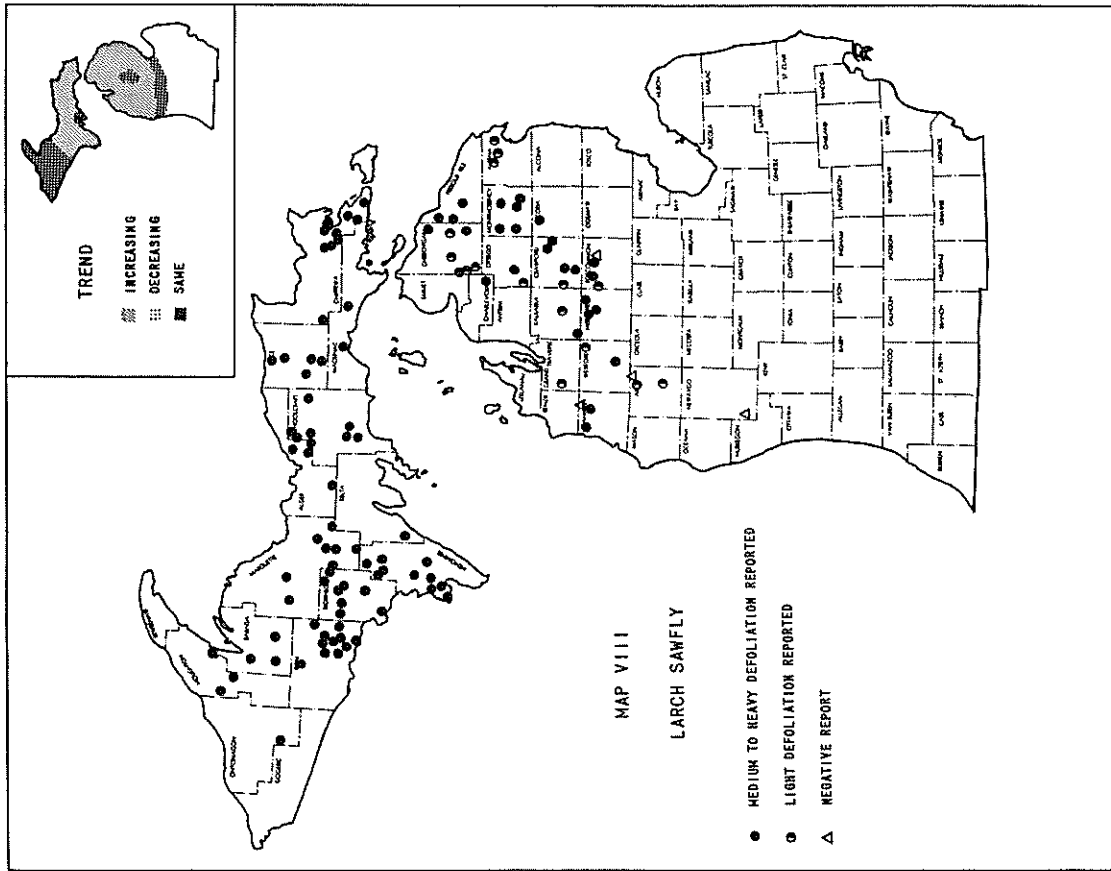
Approximately half of the positive reports listed some tree mortality due to the repeated defoliations of the sawfly. This trend can be expected to increase if the outbreak continues as anticipated.

No control measures have been applied or are contemplated for state land.

EUROPEAN PINE SAWFLY - *Neodiprion sertifer* (Geoff.)

Summary of Reports

	1951	1952	1953	1954	1955	1956	1957	1958	1959
Total.....	31	64	85	82	111	100	104	91	97
Percent Positive...	87	69	74	75	74	62	56	59	48



EUROPEAN PINE SAWFLY (Cont'd.)

Breakdown of 1959 Reports

*Heavy defoliation.....8.....(17%)
*Medium defoliation.....0.....(0%)
*Light defoliation.....39.....(83%)

*Degree of defoliation = "D" =

$$\frac{\% \text{ of susceptible trees attacked} \times \% \text{ of defoliation}}{100}$$

Heavy if "D" is greater than 24
Medium if "D" is between 9 and 24
Light if "D" is less than 9

The European pine sawfly is an important defoliator of hard pines only in the southern part of the Lower Peninsula. Heavy defoliation was reported from Huron, St. Clair, Saginaw, Tuscola and Livingston counties. Elsewhere only light defoliation was reported. (See Map IX.)

There was a decline in positive reports during 1959 although there was an increase in heavy defoliation reports. Trends, as indicated by the reports for this insect, are not always clearcut as control operations are carried on in about 20% of the plantations reported as positive. In general, these control operations keep the sawfly from causing widespread defoliation.

FOREST TENT CATERPILLAR - *Malacosoma disstria* Hbn.

Summary of Reports

	1954	1955	1956	1957	1958	1959
Total.....	117	120	111	114	109	119
Percent Positive.....	23	17	5	4	0	3

Breakdown of 1959 Reports

Heavy defoliation (61-100%).....0.....(0%)
Medium defoliation (21-60%).....0.....(0%)
Light defoliation (1-20%).....4.....(100%)

A few clusters of larvae were found in Menominee and Luce counties. This is probably the normal endemic population. Some defoliation was reported, although some of it might have been caused by the large aspen tortrix. There is no evidence at present of an upswing in the population.

SPRUCE BUDWORM - Choristoneura fumiferana (Clem.)

Summary of Reports

	1956	1957	1958	1959
Total.....	40	29	30	25
Percent Positive.....	2	3	3	0

Breakdown of 1959 Reports

Heavy defoliation (61-100%).....0.....(0%)
Medium defoliation (21-60%).....0.....(0%)
Light defoliation (1-20%).....0.....(0%)

No areas of spruce budworm outbreaks were found in Michigan. Budworm caterpillars could be found in spruce-fir stands but no noticeable defoliation was reported.

* * *

OTHER IMPORTANT INSECTS

GYPSY MOTH - Porthetria dispar (L.)

The following information on the gypsy moth was received from the Division of Plant Industry, Michigan Department of Agriculture, and is a summary of their work on the gypsy moth during 1958.

"The aerial spraying phase of the 1959 gypsy moth eradication program began in May with the spraying of 22,000 acres of private land. This acreage was based on results of the 1958 survey.

"Five thousand (5,000) traps were placed throughout a 2,104 square mile area within seven central Michigan counties, making this year's trapping program slightly larger than last year's. It was the responsibility of each of eighteen seasonal employees to trap an assigned territory of 100 square miles.

"Trapping began on July 1 and ended on August 30. Forty-four (44) male moths were recovered at six trap sites which identified three distinctly separate infestations. These infestations are located just south of Dimondale in Eaton County, between Dimondale and Grand Ledge in the same county, and just east of and adjacent to Duck Lake in Calhoun County. Egg laying was observed at the Dimondale trap site on logs, stones, trees, and neglected farming implements. All articles capable of being moved off of the property were held until the eggs were treated with creosote.

"It is estimated that there will be approximately 14,000 acres to be treated next season on the basis of the finds which were made this past summer."

ZIMMERMAN PINE MOTH - Dioryctria zimmermani (Grote)

The Zimmerman pine moth persists in pole size red pine on 3,800 acres in Wexford County. Damage is limited to deformation caused by the killing of the new shoots. Elsewhere in Michigan it is primarily a Christmas tree plantation pest, killing the new shoots as well as mining in the cambial region, sometimes killing the entire tree. Generally, mortality occurs only to trees to 4" diameter at stump height; however, two large 8" D.B.H. Austrian pine were reported killed in Saginaw County by the pine moth.

A PINE TIP MOTH - Rhyacionia adana Hein

This insect first caused concern in Michigan in 1959, although judging from its distribution, it has been present for many years. It attacks red, Scotch and jack pines and was found in nearly all red pine plantations under three feet where a search was made. In most cases, the tip killing was slight and little damage occurred. Occasionally, however, the infestation was heavy enough so that some reduction in growth and deformation was caused. After the trees reach a height of about three feet this insect ceases to be a problem.

The pest was found in all counties checked, indicating a rather widespread distribution. Known distribution at present includes Gogebic, Dickinson, Schoolcraft and Luce counties in Upper Michigan and Charlevoix, Otsego, Kalkaska, Crawford and Mecosta counties in Lower Michigan.

PINE PITCH MIDGE - Retinodiplosis sp.

The pine pitch midge is increasing, particularly in the central Lower Peninsula. Jack pine up to 30 feet high in parts of Crawford and Roscommon counties showed considerable flagging, and 50% of the 12 feet jack pine in a roadside planting north of Grayling had more than 90% of twigs killed.

PINE ROOT COLLAR WEEVIL - Hylobius radicus Buch.

Damage by the pine root collar weevil is increasing in the Lower Peninsula. In the past injury has been largely confined to roadside windbreaks, particularly those of Scotch pine, but recently red and jack pine in plantations have been killed. The weevil was found to be widely distributed through several plantations in Kalkaska, Grand Traverse and Wexford counties, although tree mortality at present is light. Red pines in a 25-year old plantation in Manistee County were reported killed.

WHITE GRUBS

Continuous high populations of white grubs have caused great losses in recently planted areas on the pine stump plains in parts of Luce and Schoolcraft counties. In one area, in two years approximately 40% of the trees were killed. In 1958 trees were treated with sprayers mounted on the planting machine that sprayed the roots and surrounding soil with an aldrin solution as the trees were

planted. After two growing seasons, only six per cent of the treated trees had been killed by grubs.

During the fall 1959 planting season, trees planted on 1,414 acres in Luce County on the Lake Superior and Mackinac State Forests were treated with an aldrin spray as they were planted.

PINE TORTOISE SCALE - Toumeyella numisaticum (P. & McD.)

Two infestations of the pine tortoise scale were reported; one on 20' ornamental Scotch pine in Isabella County and the other in a 15' jack pine plantation in Livingston County. Some of the jack pine in the latter area had been killed and others were heavily infested.

PITCH BLISTER MOTH - Petrova sp.

The U. S. Forest Service reported that the pitch blister moth was causing deformation, growth loss, and some mortality on about 1,000 acres of jack pine on the Rapid River District of the Upper Michigan National Forest.

BIRCH SKELETONIZER - Bucculatrix canadensisella Chamb.

Scattered areas of widespread defoliation of birch trees by the birch skeletonizer were apparent in both peninsulas. This defoliation occurs late in the summer and probably has little or no effect on the growth unless repeated for many years.

OAK SKELETONIZER - Bucculatrix ainsliella Murt.

Oak leaves were severely skeletonized for six to eight miles along the lake shore north of Benton Harbor in Berrien County.

* * *

DISEASES

OAK WILT - Ceratocystis fagacearum (Bretz) Hunt

Since 1951 when oak wilt was first identified in Michigan, a total of 432 infection centers have been located. Many of these are now inactive due either to natural causes or to control measures. In 1959 fewer new infection centers and active old centers were found than in any previous year, thus continuing the encouraging downward trend.

The oak wilt program in Michigan in 1959 was carried on in a manner similar

to that used in the past three years. Possible infected trees are located from the air and then checked by ground crews. If wilt is apparent, the infected trees are treated with 2,4-D ester. All similar type oaks within a 50 foot radius are similarly treated.

This year five southwestern counties, comprising the most heavily infected area, were flown over at one mile intervals and three adjacent counties at two mile intervals. Those covered at the one mile interval were Cass, St. Joseph, Barry, Kalamazoo and the south half of Van Buren. Two Conservation Department planes were used a total of 77.8 hours on the surveys, with both Conservation Department and State Department of Agriculture observers. Flying costs were shared by the two departments. Ground checking by Department of Agriculture field crews located 85 oak wilt infected trees at 51 infection centers. Of these, 21 were old centers and 30 were new. Wilt was not found in any additional counties where it had not previously been reported. (See Map X.)

DUTCH ELM DISEASE - *Ceratostomella ulmi* (Schwarz) Buisman

A cooperative program of survey and control is coordinated by the State Department of Agriculture working with local units of government. This department is responsible for the survey and enforcement phase of the program, and the municipalities conduct the necessary sanitation and spraying. Laboratory facilities for diagnosing Dutch elm disease and oak wilt are maintained at Michigan State University; the laboratory is permanently housed in the new State Department of Agriculture Chemical Control Laboratories Building.

Dutch elm disease was discovered in the Detroit area in 1950, and has since spread across the southern part of the Lower Peninsula and as far north as Bay and Muskegon counties. (See Map XI.)

The following statement regarding the 1959 Dutch elm disease program was prepared by the Division of Plant Industry of the State Department of Agriculture.

"All Dutch elm disease activities carried on by the Plant Industry Division have been restricted to communities carrying on a spray and sanitation program. The surveys have been confined to city limits, and no buffer surveys are being made.

"There has been a drop in the total samples taken in 1959 as compared to last year. There has also been a drop in the number of diseased trees as well as the trees which were condemned due to their dead or dying condition. The only increase which has been shown this season is in the number of woodpiles condemned by the Plant Industry Division. This is an indication of the emphasis being put on the sanitation part of a control program. Of the number of samples submitted to the laboratory this year, approximately 80% were found to be positive. This would indicate that the seasonal personnel are well versed in detecting the visual symptoms of this disease.

"Most all of the communities which are carrying on a control program and which have conducted such a program over past seasons are showing a decided decrease in the numbers of diseased trees. The decrease in these communities should decrease during the next few years."

In addition to sanitation and control programs carried on by municipalities, the Parks Division of the Conservation Department has had a Dutch elm disease program in its southern Michigan state parks and recreation areas since 1953. Special funds for this work were first appropriated in 1956.

The survey program in the sixteen recreation areas and state parks is carried on by the park personnel in each unit. Park personnel drive through their areas each month from June to October. Samples are taken from any tree suspected of having the Dutch elm disease and sent to the Michigan Department of Agriculture.

Samples were taken from 107 suspected trees and of these, 71 trees were infected. A total of 73 trees was removed, including two trees that were not sampled.

Sanitation by a private contractor was completed in 10 areas with 9,749 trees trimmed and 298 trees removed. The sanitation work is done only on the most important and developed protective areas.

WHITE PINE BLISTER RUST - *Cronartium ribicola* Fischer

A detailed report of the white pine blister rust situation and control program is prepared annually by the Area Leader for this cooperative federal-state project. A brief summary of this report for 1959 follows:

White pine blister rust survey and control operations were carried on in the Upper Peninsula and northern part of the Lower Peninsula in 1959. Mapping was completed on approximately 39,000 acres of control area containing about 22,000 acres of white pine. These surveys were made during the fall, winter, and early spring seasons by regularly assigned personnel. Aerial surveys by helicopter and fixed wing planes aided in locating potential white pine stands.

Ribes eradication started in early May and continued through the first week of October. Corrections Department conservation camps furnished the bulk of labor for ribes eradication on state and private lands. Work on federal and private lands was done by contract crews. On July 1st, responsibility for blister rust control work on national forests was assumed by the forests. Rangers are now responsible for control work as a part of their timber management activities.

At the present time there are on record, 500,000 acres of white pine which have been determined to be adequately stocked. To protect this acreage, ribes eradication is necessary on 1,362,000 acres of control area. By the end of 1959, 88 percent of the control area had received initial eradication and 48 percent had been placed on maintenance. About 80 percent of the control area on national forests is now on maintenance. Only 37 percent of the control area in private ownership is on maintenance. Of the non-federal public ownership, mainly state, 52 percent is on maintenance.

During the summer of 1959, 17,000 acres of pine were protected by destroying 471,000 ribes plants on 34,000 acres of control area. This work was done with an expenditure of 3,675 man days.

One plantation on the Ottawa National Forest was given a cultural and

canker elimination pruning. A total of 78,000 trees was examined, of which 5,980 were treated by removing 8,970 cankers.

Antibiotics were used to kill cankers on over 300 test trees. Results of earlier treatments with Actidione look favorable.

Heavy fruiting of cankers started in southern Michigan near the end of April. Peak production of aecia spores occurred in northern Michigan about the middle of May. There followed an abundance of telia in September, lasting in the northern areas into early October. The cool, wet fall should have been favorable to development of rust on white pine.

MAPLE BLIGHT

In the summer of 1957 a mysterious disease which has been called "maple blight" caused concern when it appeared in a limited area near Goodman in northern Wisconsin. Little was known about the disease which killed hard maples of all sizes. A research project was set up under the Lake States Forest Experiment Station, to study the problem and a survey was organized in 1958 to determine the extent of the disease. In Michigan the field organization of the Pest Detection Program was utilized to examine and report on any areas of dying maple which appeared to have the symptoms exhibited in the Wisconsin area.

To date no areas in Michigan showing the blight symptoms have been found, and there has been little spread or enlargement of the Wisconsin area. Research has not turned up any single insect or pathogen which could have caused the trouble, although an unusual combination of insect attacks which caused a series of defoliations is strongly suspected of being a major factor. In the meantime both surveys and research are continuing.

* * *

OTHER CONDITIONS

PINE MORTALITY

Pines in many areas died from unexplained reasons. In Ontonagon and Iron counties red and jack pine continued to die. Although many factors are involved, heavy Saratoga spittlebug feeding, shoe string root rot (Armillaria mellea), and drought conditions are of prime importance.

In Luce County pine weakened by previous severe summer frost injury and drought continued to succumb.

Pines in some Schoolcraft County plantations showed branch and tree mortality. Major factors causing this are probably a lowered water table and poorly developed root systems as a result of poor planting.

OAK MORTALITY

As a result of heavy defoliation by the fruit tree leaf roller during 1956 and 1957, severe late spring frosts in 1958, and drought conditions since 1955, some large areas of oak have died in Roscommon, Crawford, Oscoda and Ogemaw counties.

Beginning in 1958, the dying of the oak progressed rapidly so that by 1959 over 29,000 acres were affected. Aerial and ground surveys in September 1959 disclosed that approximately 43,200 cords of oak have been killed. The mortality is restricted almost exclusively to the red oak group.

The area was checked by pathologists from the Michigan Department of Agriculture and Michigan State University because of the possibility that oak wilt on some other disease pathogen might be playing an important part in the oak mortality. The tests were negative as no primary pathogens were found.

It has been recommended that salvage operations and reforestation be initiated where possible. However, in many areas, low quality and volumes will preclude salvaging the dead trees.

SNOW BREAKAGE

Snow breakage occurred in some plantations in the northwestern Lower Peninsula. Branches two and one-half to three feet above the ground were torn downward leaving wounds on the trunk that partly girdled the tree and that would provide entrance points for wood rotting fungi.

Figure 5.

Branches broken
by heavy snow.



SUMMARY

State, private, and federal foresters submitted a total of 1,929 observation reports on forest insects during 1959. In addition, many letters and cards were received giving information on insect conditions.

Jack pine budworm populations remained low for the second year, although a few areas of activity were reported in the Upper Peninsula on state and federal land.

White pine weevil infestations continued at a high level on jack and white pines in many places, 60% of the trees being attacked. Damage to red pine increased. The U. S. F. S. aeri ally sprayed 50 acres of jack pine and the state hand sprayed 707 acres of jack pine for weevil control.

European pine shoot moth damage was greatly reduced following the severe winter of 1958-59, during which many of the overwintering larvae were killed.

Red-headed pine sawfly populations remained at a high level, severely damaging many stands. Control by aerial spraying was used on 2,999 acres of state land and 47 acres of federal land.

Saratoga spittlebugs decreased in the Lower Peninsula and increased in the Upper Peninsula. In July 558 acres of state land and 458 acres of federal land were aerial sprayed to control this pest.

Anomala beetle infestations remained low and very little defoliation occurred.

Larch stands throughout the Upper Peninsula and northern Lower Peninsula continue to be heavily defoliated by the larch sawfly. Some larch mortality has been reported.

Heavy defoliation by the European pine sawfly was reported from the southeastern section of the Lower Peninsula and only light defoliation from the southwestern section.

The forest tent caterpillars remained at the low point in their cycle.

No areas of spruce budworm defoliation were reported.

An aerial spray program was used on 22,000 acres by the Michigan Department of Agriculture to control the gypsy moth. Their trapping program indicated that approximately 14,000 acres will have to be sprayed in 1960.

A pine tip moth, *Rhyacionia adana*, first became apparent in Michigan in 1959, although it probably has been present for many years. Damage is limited to trees less than three feet high.

Deformity and tree mortality caused by the Zimmerman pine moth increased and caused concern among tree growers in the southern part of the Lower Peninsula.

The pine pitch midge, pine root collar weevil, white grubs, pine tortoise scale, and other insects caused defoliation or damage of local concern.

Red and jack pines in many areas died from unexplained reasons. Insect attack, poor planting and drought undoubtedly were important contributing factors to the mortality.

Fewer new oak wilt infection centers and active old centers were found in 1959 than in previous years, thus continuing the encouraging downward trend.

Most all of the communities which are carrying on a Dutch elm disease control program and which have had a program over past seasons, are showing a decided decrease in numbers of diseased trees. The spraying and sanitation program in the most important and developed protective areas of the state park and recreation areas in the southern part of the Lower Peninsula is continuing.

Blister rust control work to protect 17,000 acres of white pine was done on 34,000 acres by destroying the ribes plants.

Large areas of oak in the central Lower Peninsula died as a result of fruit tree leaf roller defoliation, late spring frost and drought conditions.

* * *

